Helping Massachusetts Municipalities Create a Greener Energy Future

COMMONWEALTH OF MASSACHUSETTS

Deval L. Patrick, Governor
Timothy P. Murray, Lt. Governor
Ian A. Bowles, Secretary
Phil Giudice, Commissioner
Mark Sylvia, Director

DEPARTMENT OF ENERGY RESOURCES

Green Communities

Webinar

December 1, 2010

10:00 am

Solar 101

Natalie Andrews

Renewables Energy Project Coordinator

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Green Communities Division

Serves as the hub for all Massachusetts cities and towns on energy matters

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Creating A Greener Energy Future For the Commonwealth

Recording & Presentation

- The webinar is being recorded and will be available for viewing at your convenience. It will be posted on our website at: www.mass.gov/energy/greencommunities
- The slide presentation will also be posted at: www.mass.gov/energy/greencommunities
- Websites are also listed at end of presentation

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Creating A Greener Energy Future For the Commonwealth

Presentation Topics

- **Basics of solar photovoltaics**
- What makes for a good site?
- How to maximize incentives
- Basics of procurement

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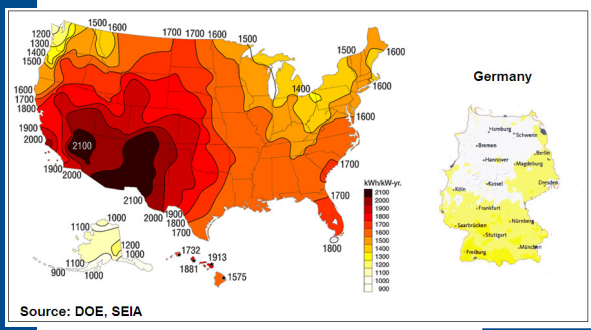
Creating A Greener Energy Future For the Commonwealth

Is there enough sun in Mass.?



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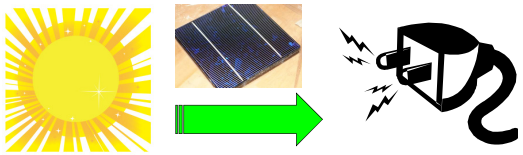
DOER Massachusetts Department of Energy Resources

How does solar PV work?



Sunlight + Semiconductor materials = Electricity

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Inside a PV Cell

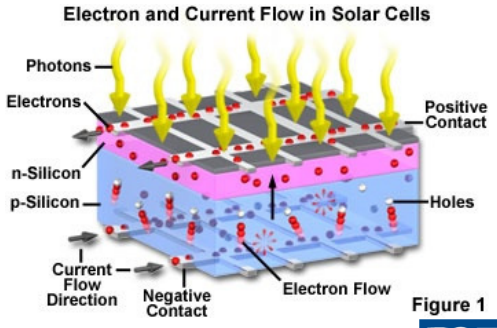

Figure 1

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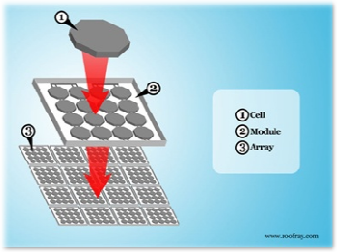
DOER Massachusetts Department of Energy Resources

Photovoltaic (PV) Hierarchy

- Cell < Module < Array



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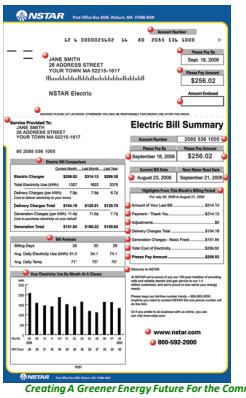
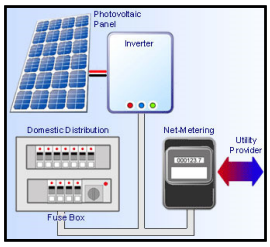
DOER Massachusetts Department of Energy Resources

Kilowatt Hours (kWh)



Grid-Tied System

- Advantages
  - Easier to install and maintain
  - Less expensive
  - Grid can supply power
  - Feed excess electricity back to grid
- Disadvantages
  - No power if grid goes down



Source: Morningsolar Inc

Presentation Topics

- Basics of solar photovoltaic
- **What makes for a good site?**
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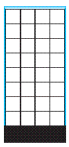
Solar Access

- Optimum Solar Window 9 AM – 3 PM
- Array should have NO SHADING in this window (or longer if possible)

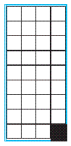
Natural solar tracker

Shading on Modules

- SHADING can half or even completely eliminate the output of a solar array!

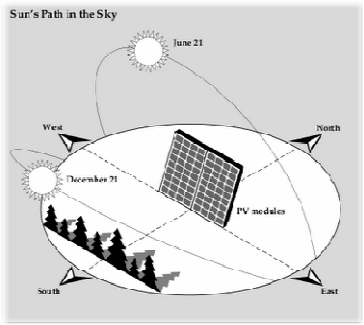


Example of full-cell shading that can reduce PV module power to zero



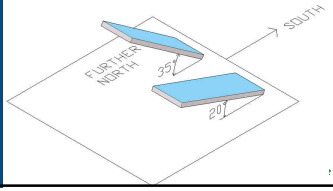
Example of full-cell shading that can reduce PV module power by ½

Orientation



Site Selection – Tilt Angle

Max performance is achieved when panels are perpendicular to the sun's rays



Year round tilt = latitude
Winter + 15 lat.
Summer – 15 lat.

General Considerations

- Access to an interconnection point nearby
- Accessibility to the inverter and solar array
- Insurance for the PV array
  - General Liability
  - Property Risk
  - Environmental Risk
  - Business Interruption

Roof Mount Considerations

- Newer roof
- Structurally sound
- Penetrate the roof as little as possible
- Setbacks
- Leave 4-6" airspace between roof and modules
- On sloped roofs, fasten mounts to rafters not decking

Ground Mount Considerations

- Flat is ideal
- Wind speed at the site
- Soil type and strength characteristics
- Perimeter fencing
- Theft
- Access
- Storm water runoff
- Landfill Sites there are additional considerations

WMECo Solar Array 1.8 MW

Size

- Rule of thumb for open roof: 150ft^2 = 1 kW
- Ground mount 250 kW = 1 acre
- Typical residential system would be anywhere from 1kW-7kW
- Incentives go up to 6 MW so "solar farms" will begin to be more popular
- IMBY http://www.nrel.gov/eis/imby/

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Massachusetts Solar (PV) Development Strategies

- Governor Patrick's goal – 250 MW by 2017
- Commonwealth Solar (Rebates) – initiated Dec. 2007
  - Rebate Program: $68 million, 27 MW
  - Successfully achieved and completed Oct. 2009
  - Created robust PV development sector in MA
- Commonwealth Solar II (Rebates)
- Renewable Portfolio Standard (RPS) Solar Carve-Out – launched 1/1/2010
  - Creates Solar Renewable Energy Certificates (SRECs) to support solar development/financing
  - Targets solar growth to 400 MW
- Net metering
- Federal Government offers tax incentives and depreciation

Purchase Options

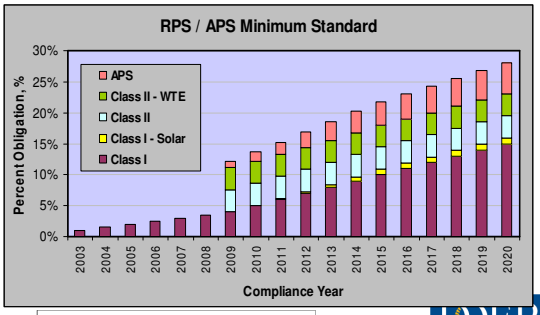
- Outright purchase
  - Rebates, SRECs
- Land Lease
- Third party model with a Power Purchase Agreement (PPA)
  - Rebates, SRECs, state and federal tax incentives

Oakmont Regional High School 16.8 kW

Benefits of PPA

- No up-front cost
- Ability for tax-exempt entity to enjoy lower electricity prices thanks to savings passed on from federal tax incentives and SRECs
- A predictable cost of electricity over 15–25 years
- No need to deal with complex system design and permitting process
- No operating and maintenance responsibilities

Cumulative Obligations of RPS / APS* Programs



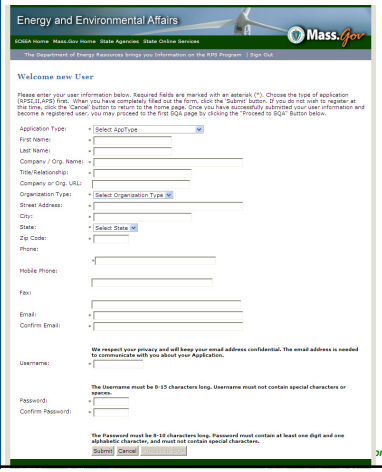
*Alternative Portfolio Standard (APS)

SREC Basics

- The RPS Solar Carve-Out is a market-based incentive
- Project eligibility criteria
- 1 SREC = 1,000 kWh of generation
- In 2010 require 30 MW = ~34,000 MWh must be met with Solar PV
- 30% growth rate if no triggers
- ACP rate of $600/SREC
- Auction Account of $285/SREC

How much are SRECs worth?

- Between $285 - $600/SREC
- Aggregators and Brokers will charge a fee
- Example: 200kW project generates 249 SRECs a year at $285 = $70,965
- Example: 16.8 kW municipal project generates 20 SRECs @ $285 = $5,700
- Example: 5kW residential project generates 6 SRECs a year @ $285 = $1,710



Statement of Qualification Application Form

User Registration

RPS Solar Carve-Out
Regulatory Update

- DOER filed Emergency Regulations on 1/8/2010 to establish program and compliance obligation starting 1/1/2010.
- Public Hearing held March 2nd written comments were accepted.
- Final regulations filed soon
- Web-based Statement of Qualification Application (SQA) is available.
- http://rps-aps.ene.state.ma.us/

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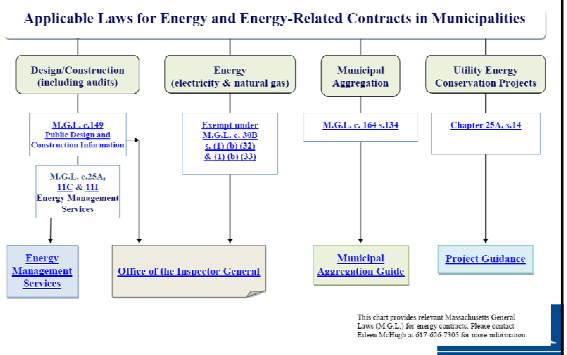
- **Basics of procurement**

Procurement laws



Procurement Process

- Select procurement path
- Issue solicitation/s
- Select winning bidder
  - Quality
  - Experience
- Handbook being developed for municipalities – *Developing PV on Closed Landfills*

Watertown DPW building 50 kW (PPA)

Additional Resources

- Solar Basics
  - http://apps1.eere.energy.gov/solar/cfm/faqs/
  - http://science.howstuffworks.com/environmental/energy/solar-cell.htm
- IMBY- tool to calculate the size of a solar array
  - http://www.nrel.gov/eis/imby/
- Commonwealth Solar II
  - http://www.masscec.com/index.cfm/pid/11159/cdid/11241
- SRECs
  - http://www.mass.gov/energy/solar
- PPA Checklist for State and Local Governments
  - http://www.nrel.gov/docs/fy10osti/46668.pdf
- Procurement Assistance
  - **M.G.L. c. 25A**– Eileen.McHugh@state.ma.us
  - For questions regarding procurement under **M.G.L. c. 30B,** call the Chapter 30B line five days a week at (617) 722-8838 from 9:00 A.M. to 4:30 P.M. For questions regarding procurement under **M.G.L. c. 149**, call the Attorney General's office, Deborah Anderson at 617-727-2200 ext. 2371 or Brian O'Donnell at 617-727-2200 ext. 2340.

Thank you

Contact information:

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617-626-7343
www.mass.gov/doer

OUTREACH - REGIONAL COORDINATORS

- Regional Coordinators act as direct liaisons with cities and towns on energy efficiency and renewable energy activities
- Located at each of the DEP Regional Offices:
  - SERO – LAKEVILLE: Seth Pickering
    - Seth.Pickering@state.ma.us
  - NERO – WILMINGTON: Joanne Bissetta:
    - Joanne.Bissetta@state.ma.us
  - CERO – WORCESTER: Kelly Brown
    - Kelly.Brown@state.ma.us
  - WERO – SPRINGFIELD: Jim Barry
    - Jim.Barry@state.ma.us

Green Communities Division Programs & Resources for Municipalities

- Green Communities Grant and Planning Assistance Program
- MassEnergyInsight System
- Municipal Energy Efficiency Program
- Energy Performance Contracting Technical Assistance
- ARRA Stimulus Funding
- Website filled with tools & resources for municipalities:
  www.mass.gov/energy/greencommunities
- Email updates via listserv – Sign up today by send an email to:
  join-ene-greencommunities @listserv.state.ma.us